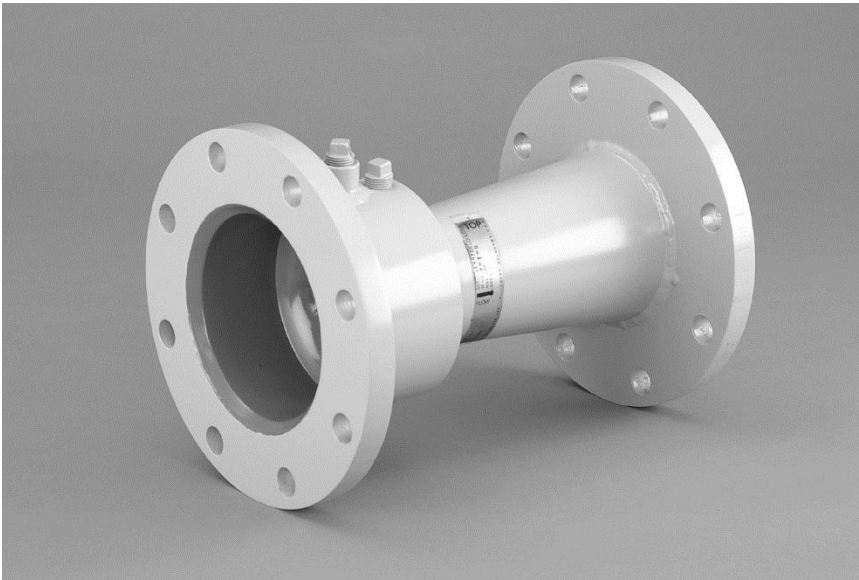


Wyatt Badger Lo-Loss® Flow Tubes
Fabricated Primary Elements



FEATURES:

- **Lowest Pressure Loss**
- **Light Weight**
- **Low Cost of Ownership**
- **Custom Designed**
- **Short Laying Length**
- **Best Documented Flow Tube on the Market**

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Description

Wyatt Engineering's fabricated PMT Lo-Loss® meters are differential producers that maintain their accuracy over a wide range of flow rates and incur lower permanent pressure loss than any other differential producing flow device. These units can be made from virtually any weldable or machinable material to address the differing requirements of your applications. Lo-Loss® flow tubes are characterized by longevity of service and flexibility in design.

Application

The fabricated series of Lo-Loss® meters are often used in applications where the flow stream demands intelligent decisions regarding materials of construction. This is due to the extremes of pressure, temperature, and/or the aggressive nature of the fluid being metered. A short list of Lo-Loss® installations include:

Power Plants
Refineries
Petrochemical Plants
Cryogenic Processes
Water and Wastewater Plants
Steam Custody Transfer
Fiscal Metering

Flow Measurement Accuracy

For pipe Reynolds numbers greater than 100 000 and a normalized piping configuration, the Wyatt Badger PMT Lo-Loss® meter provides a flow measurement accuracy of $\pm 0.25\%$ with independent flow calibration and $\pm 1.00\%$ without flow calibration.



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Technical Specifications

Accuracy

For pipe Reynolds numbers greater than 100 000 and a normalized piping configuration, the Wyatt Lo-Loss® Meter provides a flow measurement uncertainty of:

- ± 1.00% for standard QS9001 calibrated meters and
- ± 0.25% for flow calibrated meters.

Pressure Loss

As shown in Figure 1, the permanent pressure loss of the Lo-Loss® PMT-U, expressed as a percentage of differential pressure, is significantly lower than that of short-form and long-form Venturis as well.

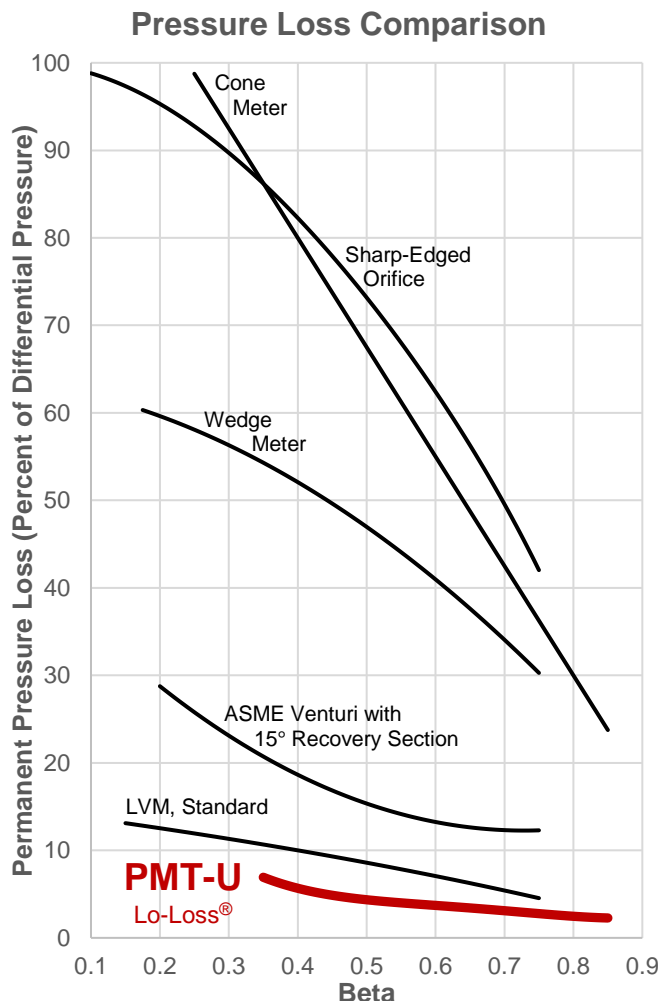


Figure 1

Beta Ratio

Wyatt can furnish PMT-U Lo-Loss® meters with a wide range of diameter ratios (d/D). This provides users with accurate flow measurement over a broad range of flow rates for a given line size.

Temperature Range

Dependent on the materials of construction, the fabricated PMT-U can operate over a fluid temperature range of -425 °F to +1200 °F (-250 °C and +650 °C). Wyatt can fabricate the PMT-U to meet the line conditions of your application.

Pressure Range/End Connections

Flanged end connections, per ANSI B16.5 or 16.47 for 150 PSIG through 2500 PSIG service, are available. Various end connections are also available, including plate, slip-on, weld neck, Van Stone, RTJ, or beveled (for butt-welding).

Piping Requirements

Designed for full-pipe flow, PMT-U flow meters may be mounted either horizontally or vertically. For recommended upstream piping, refer to Wyatt Engineering Design Manual for the PMT Lo-Loss® design.

Energy Considerations

Figure 1 compares the permanent pressure loss of the Lo-Loss® design with that of other primary flow elements. Figure 2 illustrates the reduced pumping costs that are realized when using a Lo-Loss® Meter in a typical example. The pressure recovery of the Wyatt Lo-Loss® Meter means reduced pumping costs. High beta ratio Lo-Loss® Meters will recover up to 97.5% of the differential pressure produced. This is two to four times better than standard classical Venturi devices, as well as most modified Venturi meters.

Using Venturi tubes instead of orifice plates can yield significant savings and using the Lo-Loss® meter instead of Venturi tubes can realize further savings. For over 60 years, engineers have given their clients the benefits of efficiency and accuracy by doing just that.

Annual Pumping Cost Savings Comparison of Differential Producers

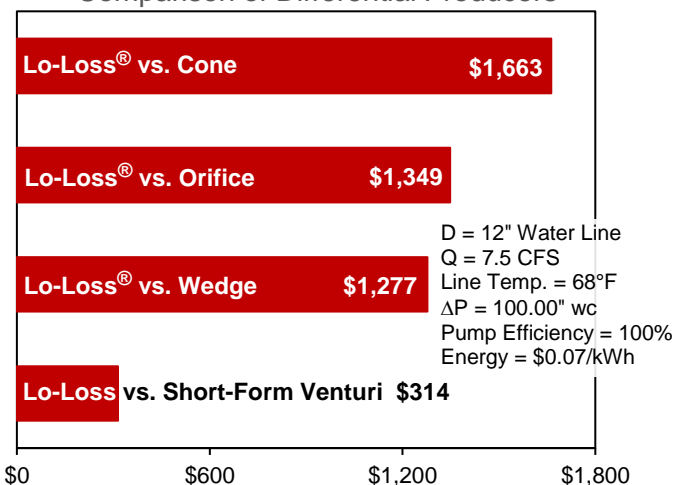


Figure 2, Using the Lo-Loss® Meter Saves in Pumping Costs

PMT-U Sizing Table

Inlet Diameter		Throat Diameter		Beta Ratio	Overall Length		Outlet Diameter		ΔP = Differential Pressure of 100" wc (24.864 kPaD)						
									Water Flow at 60 °F (16 °C)				ΔH = Headloss		
(inches)	(mm)	(inches)	(mm)		(inches)	(mm)	(inches)	(mm)	US GPM	US MGD	LPS	m ³ /d	R _D (10 ⁻³)	in. wc	kPa
3.068	77.9	1.500	38.1	0.4889	10.30	261.6	2.50	63.5	111.50	0.161	7.035	607.79	103	4.4	1.11
3.068	77.9	1.800	45.7	0.5867	9.20	233.7	2.60	66.0	160.38	0.231	10.118	874.23	148	3.8	0.94
3.068	77.9	2.100	53.3	0.6845	8.00	203.2	2.70	68.6	221.44	0.319	13.971	1207.1	204	3.2	0.80
4.026	102.3	2.000	50.8	0.4968	13.50	342.9	3.30	83.8	198.12	0.285	12.499	1079.9	139	4.4	1.09
4.026	102.3	2.400	61.0	0.5961	12.00	304.8	3.50	88.9	285.29	0.411	17.999	1555.1	200	3.7	0.93
4.026	102.3	2.800	71.1	0.6955	10.50	266.7	3.60	91.4	394.86	0.569	24.912	2152.4	277	3.1	0.78
6.065	154.1	3.000	76.2	0.4946	20.30	515.6	5.00	127.0	445.83	0.642	28.127	2430.2	208	4.4	1.09
6.065	154.1	3.600	91.4	0.5936	18.10	459.7	5.30	134.6	641.79	0.924	40.490	3498.4	299	3.7	0.93
6.065	154.1	4.200	106.7	0.6925	15.80	401.3	5.50	139.7	887.68	1.278	56.004	4838.7	414	3.1	0.78
7.981	202.7	4.000	101.6	0.5012	23.00	584.2	6.60	167.6	792.26	1.141	49.984	4318.6	280	4.3	1.08
7.981	202.7	4.800	121.9	0.6014	20.00	508.0	6.90	175.3	1141.6	1.644	72.024	6222.9	404	3.7	0.92
7.981	202.7	5.600	142.2	0.7017	17.00	431.8	7.20	182.9	1582.4	2.279	99.831	8625.4	560	3.1	0.77
10.02	254.5	5.000	127.0	0.4990	28.90	734.1	8.40	213.4	1238.1	1.783	78.110	6748.7	349	4.4	1.08
10.02	254.5	6.000	152.4	0.5988	25.10	637.5	8.70	221.0	1783.4	2.568	112.52	9721.3	503	3.7	0.92
10.02	254.5	7.000	177.8	0.6986	21.30	541.0	9.10	231.1	2470.1	3.557	155.84	13465	696	3.1	0.77
12.00	304.8	6.000	152.4	0.5000	34.60	878.8	10.00	254.0	1782.7	2.567	112.47	9717.5	420	4.4	1.08
12.00	304.8	7.200	182.9	0.6000	30.10	764.5	10.50	266.7	2568.3	3.698	162.04	14000	605	3.7	0.92
12.00	304.8	8.400	213.4	0.7000	25.50	647.7	10.90	276.9	3558.5	5.124	224.51	19397	838	3.1	0.77
13.25	336.6	7.000	177.8	0.5283	38.20	970.3	11.10	281.9	2423.5	3.490	152.90	13211	517	4.1	1.03
13.25	336.6	8.400	213.4	0.6340	33.20	843.3	11.50	292.1	3508.5	5.052	221.35	19125	748	3.5	0.87
13.25	336.6	9.800	248.9	0.7396	28.20	716.3	12.00	304.8	4916.0	7.079	310.15	26797	1048	2.8	0.71
15.25	387.4	8.000	203.2	0.5246	43.90	1115.1	12.70	322.6	3165.7	4.559	199.73	17256	586	4.2	1.04
15.25	387.4	9.600	243.8	0.6295	38.20	970.3	13.30	337.8	4579.8	6.595	288.94	24964	848	3.5	0.88
15.25	387.4	11.200	284.5	0.7344	32.40	823.0	13.80	350.5	6406.1	9.225	404.16	34919	1187	2.9	0.71
17.25	438.2	9.000	228.6	0.5217	49.70	1262.4	14.40	365.8	4007.0	5.770	252.80	21842	656	4.2	1.04
17.25	438.2	10.800	274.3	0.6261	43.30	1099.8	15.00	381.0	5793.8	8.343	365.53	31582	949	3.6	0.88
17.25	438.2	12.600	320.0	0.7304	36.60	929.6	15.70	398.8	8094.0	11.66	510.65	44120	1326	2.9	0.72
19.25	489.0	10.000	254.0	0.5195	55.50	1409.7	16.10	408.9	4947.3	7.124	312.13	26968	726	4.2	1.04
19.25	489.0	12.000	304.8	0.6234	48.30	1226.8	16.80	426.7	7150.5	10.30	451.12	38977	1049	3.6	0.89
19.25	489.0	14.000	355.6	0.7273	40.90	1038.9	17.50	444.5	9979.7	14.37	629.62	54399	1465	2.9	0.73
23.25	590.6	12.000	304.8	0.5161	67.00	1701.8	19.40	492.8	7125.0	10.26	449.52	38838	866	4.2	1.05
23.25	590.6	14.400	365.8	0.6194	58.30	1480.8	20.30	515.6	10292	14.82	649.32	56101	1251	3.6	0.89
23.25	590.6	16.800	426.7	0.7226	49.40	1254.8	21.10	535.9	14344	20.66	904.99	78191	1743	3.0	0.73
29.25	743.0	15.000	381.0	0.5128	84.20	2138.7	24.50	622.3	11134	16.03	702.47	60694	1075	4.3	1.06
29.25	743.0	18.000	457.2	0.6154	73.30	1861.8	25.50	647.7	16074	23.15	1014.1	87621	1553	3.6	0.90
29.25	743.0	21.000	533.4	0.7179	62.10	1577.3	26.60	675.6	22374	32.22	1411.6	121962	2161	3.0	0.74
35.25	895.4	18.000	457.2	0.5106	101.50	2578.1	29.50	749.3	16035	23.09	1011.7	87408	1285	4.3	1.06
35.25	895.4	21.600	548.6	0.6128	88.30	2242.8	30.80	782.3	23141	33.32	1460.0	126141	1855	3.6	0.90
35.25	895.4	25.200	640.1	0.7149	74.80	1899.9	32.10	815.3	32183	46.34	2030.5	175432	2579	3.0	0.75
41.25	1047.8	21.000	533.4	0.5091	118.80	3017.5	34.50	876.3	21827	31.43	1377.1	118980	1495	4.3	1.06
41.25	1047.8	25.200	640.1	0.6109	103.40	2626.4	36.10	916.9	31492	45.35	1986.8	171661	2157	3.6	0.91
41.25	1047.8	29.400	746.8	0.7127	87.50	2222.5	37.50	953	43772	63.03	2761.6	238601	2998	3.0	0.75
47.25	1200.2	24.000	609.6	0.5079	136.10	3456.9	39.60	1005.8	28511	41.06	1798.7	155412	1705	4.3	1.07
47.25	1200.2	28.800	731.5	0.6095	118.40	3007.4	41.30	1049	41127	59.22	2594.7	224181	2459	3.7	0.91
47.25	1200.2	33.600	853.4	0.7111	100.30	2547.6	43.00	1092.2	57140	82.28	3605.0	311469	3417	3.0	0.75

This sizing table can be used as a guide to aid the user in choosing the proper PMT-U for a given application and reflects the most commonly used sizes. Other sizes, pipe schedules, and special geometries are available, often at no additional cost. Depending on the details of your application, a more appropriate selection, or a more accurate estimation of the performance of a given selection, may be available. Wyatt Engineering encourages users to contact their local Wyatt representatives, or call us directly, for definitive sizing information.

Incompressible Flow Relationships:

$$\Delta P_N = 100 (Q_N / Q)^2$$

$$\Delta H_N = \Delta H (Q_N / Q)^{1.88}$$

$$Q_N = Q (\Delta P / 100)^{0.5}$$

Examples:

For a 12.00" x 7.200" PMT-U, find

ΔP at 5 000 US GPM

ΔH at 5 000 US GPM

Q_N at 500" wc

Solutions:

Found using "Incompressible Flow Relationships"

$$\Delta P_N = 100 (5\,000 / 2\,568.3)^2 = 379.01" \text{ wc}$$

$$\Delta H_N = 3.7 (5\,000 / 2\,568.3)^{1.88} = 12.9" \text{ wc}$$

$$Q_N = 2\,568.3 (500 / 100)^{0.5} = 5\,742.9 \text{ US GPM}$$

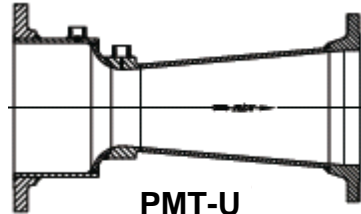
Available Options

WYATT

Fabricated PMT flow meters are available in four styles:

Model PMT-U is designed to the ASME Boiler and Pressure Vessel Code. It is typically used at operating less than 6 000 PSIG (41 350 kPaG) and temperatures less than +1 000 °F (+535 °C).

The unique construction of the Lo-Loss® **PMT-U** allows for custom designs. For example, the throat can be manu-

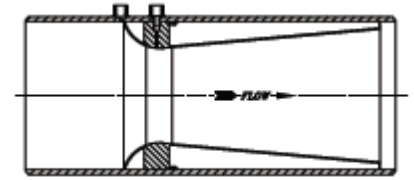


factured from a specific alloy for maximum abrasion resistance, while the cone can be constructed with a different alloy for corrosion resistance. For flexibility, multiple pressure connections are available.

Model PMT-B is designed for service in which demanding process conditions require a uniquely rugged design. Machined from forged bar material, it is ideally suited for applications in which extreme temperature cycling and/or pressure cycling is encountered, such as the power industry. While the most common sizes are 12 inches (300 mm) and less, the Wyatt bar stock design has been made from 27" (685 mm) diameter bar stock material.

Model PMT-F

is used for more demanding process temperatures and pressures. Its pipe shell design can be constructed and certified to meet the requirements of ASME B31.1 or B31.3. The **PMT-F** is available in flanged and plain-end designs.



PMT-F

Model PMT-IF is designed for insertion within the interior of a pipeline and can be secured by companion flanges or welded directly into your pipeline. For more information on fabricated insert PMT Lo-Loss® meters, see the Wyatt Engineering **PMT-IF** TECHbrief.

Materials of Construction

The versatile **PMT-U** design can be constructed from almost any material, including:

Carbon Steel
300-Series Stainless Steel
400-Series Stainless Steel
Duplex and Super Duplex

Inconel
Hastelloy B & C
Monel
Titanium

Cr-Mo Alloy
Nickel
Tantalum
Zirconium

Consult your local representative or Wyatt Engineering for information on other materials of construction.



ISO 9001:2015 Quality System
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